A Yes.
Q At the very top, you say that:
"The study I have performed for the U.S. LEC industry in the FCC Price Cap Proceeding is a close approximation to the anticipated BLS study."
Do you see that?
A Yes.
Q And that study in the FCC proceeding is the one we've been talking about, the January 1993 update, correct?
A That is correct.
Q Now, has anyone at BLS provided you with any preliminary results of the BLS LEC study?
A No.
Q Does BLS utilize the same methodology in performing its productivity studies that you used in the study that you did for the FCC proceeding?
A Yes, a very similar methodology.
Q Are there any differences?
A Some minor differences, yes.
Q Could you tell us what those differences are?
A Yes. The BLS uses a slightly different assumption for the decline in efficiency of capital stock.
Q Could you explain what you mean when you say "the decline in efficiency in capital stock"?

A Yes. To compute capital input, one has to assume a decline -- some pattern of the decline in efficiency over time. And economists are in general agreement what this pattern looks like, declining efficiency over time.

But there is some difference in opinion as to what the specific function or form is that should be used, and many economists, including myself, use the geometric decay assumption whereas the Bureau of Labor Statistics uses a hyperbolic decay function.

Q Is it true that the BLS calculates the change in input quantity by first constructing an input price index and then inflating input expenditures by that price index? ]

A Not to capital stock, no.

Q Do you know how the BLS treats interest costs?

A Well, my understanding, based on the BLS literature, is that they compute a user cost very much the same way I compute a user cost.

Q Are there any differences between your method and the BLS method?

A Not aware of any other than that which I have already discussed.

Q Do you know whether BLS has studied productivity growth rate in other sectors of the United States telecommunications industry?

A Other than telecommunications?

Q No. Other sectors of the telecommunications

industry other than the LECs?
A Not to my knowledge.
Q Dr. Christensen, would you agree that, particularly for an industry that is heavily impacted by technological change, the nature of a firm's output may change qualitatively from one period to the next?
A Well, that's true for any industry.
Q Now personal computers, for example, keep getting more powerful each year; is that right?
A Yes.
Q If the quantity of personal computers produced each year remained constant but the capability of each unit increased by, say, 25 percent, how would that factor be reflected in the measurement of output quantity change that you utilize in your TFP study?
A Well, I didn't make any explicit assumption about the price quantity, the composition of capital, capital expenditures. That fact is based on the TPIs.
Q You made no assumption about them, the price quantity ratios?
A That's correct. That's part of the TPI computation.
Q Would you agree that an input in the LEC industry may well be an output of some other industry segment?
A Yes.
In fact, about 25 percent of the inputs used by the LECs are what are called intermediate goods.

Q And one of those, for example, one of the LECs' capital inputs consists of some of the outputs in the telecommunications equipment industry; is that right?

A Yes, but those wouldn't be considered intermediate goods. Those would be considered capital goods.

Q Is the nature of the equipment used by LECs constant over time, or does it undergo any qualitative change from one period to the next?

A No, it changes over time.

Q Now Dr. Christensen, you said earlier today that you had reviewed Dr. Duncan's testimony?

A I said I had read it.

Q Did you discuss it with Dr. Duncan before he submitted it, either the direct or the reply?

A No.

Q Did you have any discussions with anyone at GTE about responding to Dr. Selwyn's testimony concerning the Bush-Uretsky report in the FCC order?

A No, I did not.

Q Why is it that you chose in your reply testimony not to respond to Dr. Selwyn's testimony about Bush-Uretsky other than the single reference you make on page 10 of your reply?

A Well, as I indicate on page 10 of my reply, this Bush-Uretsky was not really speaking to anything at issue in this proceeding.

Bush-Uretsky were looking at a very specific question. They wanted to update an interexchange or, I should say, interstate TFP estimate that the FCC had done for the 1984 to 1990 period. And I don't believe that's at issue here.

What is at issue here is the question of whether on a going-forward basis there's reason to believe that input prices for the LECs will rise less rapidly or more rapidly than for the economy as a whole.

And the Commission, the FCC, was very clear in its decision that Dr. Selwyn's claim that the post-divestiture input price information was not a reliable basis for forecasting input price differences going forward.

Q Dr. Duncan spends 11 pages of his 11-page reply testimony challenging the Bush-Uretsky analysis; do you recall that?

A I do.

Q Is your opinion that that testimony by Dr. Duncan therefore is essentially irrelevant to what the Commission is considering here?

A Well, I believe the whole Bush-Uretsky thing is irrelevant and, therefore, Dr. Duncan's critique of it is irrelevant.

Q Yesterday I asked Dr. Schmalensee whether he agreed that the -- that if there were an input price differential between the LECs and the economy as a whole

that it ought to be reflected in the TFP study.
Do you recall that?
A I do.
Q And he agreed that if there were such a differential that it ought to be reflected. Do you agree?
A Yes.
Q Is that your opinion as well?
A I believe that's what I testified in my original submission.
Q So again, the difference between you and Dr. Selwyn on this issue is a factual question of whether that input price differential exists, not how it ought to be in a TFP study; right?
A Well, a question of whether it will exist.
Q Yes.
A Not whether you can take some historic forecast period and say there was an input price differential.
The question for this Commission on a going-forward basis, are we looking to see input price differential between the LECs and the U.S. economy.
Q And you believe that we don't?
A That's correct.
And I would refer you to my Chart 5 which I think makes that very clear. Chart 5 and Page 14 of my reply testimony which shows the from 1949 through 1993 the input price differential.

And we'll see in Chart 4 just above it that there has virtually been -- virtually no difference. For the U.S. economy, there's been an average input price growth of 4.75 percent per year; whereas for the telephone industry, it's been 4.7 percent per year. Virtually no difference.

As we can see in Chart 4, those lines right on top of each other, there is a lot of year-to-year variation as we see in Chart 5.

And what Dr. Selwyn would ask you to do is to look at Chart 5 and just take that part in the lower right-hand corner where it's all below the line and say, let's use it as our forecast, which really doesn't make any sense because, you know, that's just what Dr. Selwyn likes to call cherry picking.

It's, you know -- take the point you're trying to prove and going, looking for some numbers that allegedly prove that which this doesn't at all.

If you look at the year immediately before that, you see that it's very much above the line. That was a period when LEC input prices were much greater than the U.S. economy.

And there's a simple explanation for this. The years just before 1984 were a period of rapidly rising interest rates, and that makes LEC input prices rise more rapidly than U.S. input prices; whereas in the years from 1984 forward, for quite a few years there's dramatically falling interest rates. That makes LEC prices fall relative to input prices in the U.S. economy.

Well, over the past, over the post-divestiture period, we had interest rates that have -- that are now half as high as they were. They have fallen from something on the order of, you know, 14 percent down to 7 percent. In order to use that period of forecast forward, we'd have to assume that interest rates were going down from 7 percent to zero in the next few years, and that's just not a reasonable assumption to make.

And therefore, I think we really have to -- and I think most economists would say we have to look at input price growth. We need to look at a longer term differential you just can't take a short period. Or if you do want to a take a short period. You should look at what's currently happening and say, well, let's look at current data. Well, I don't think '84 is current. I don't think most people would. 1984 is more than 10 years ago.

We're trying to now -- we're asking is this input price differential appropriate in 1996 going forward? Would we want to use 1990 and -- 1984 through 1992 to measure that? I don't think so.

I think we have to do one of two things: We need to either take the long-run historical record, which shows that there's no difference; or if we think there's something peculiar that's going to happen in the LEC industry going forward, we should look specifically at what's happening currently.

And the most recent data suggests that for the years that interest rates were falling, that, yes, LEC capital input prices were growing less rapidly, but labor input prices were growing a bit more rapidly for the LECs.

As the LECs also downsize and reduce their labor forces, the mix of labor is moving in the direction of more highly skilled labor. And whose -- therefore, if you look at the input price for labor, that is rising relative to rest to the economy.

When you combine that with capital, you see there's essentially no difference.

Q I don't know what the answer to my question was.

(Laughter)

MR. FABER: I thought that what I asked was --

MR. SASSER: Would you like it read back?

(Laughter)

MR. FABER: I have in mind what I asked. I just don't know what he said in response.

Q The question was, do you agree that the only difference between you and Dr. Selwyn is that you have a factual dispute about whether there is going to be a long-term input price differential?

A No. You didn't see "is going to be." You said whether there was.

Q That's correct. You corrected me. I said whether there was, and you said "is going to be," and I'm willing to accept that correction.

A Is --

Q All I want to know is, do you agree that the difference between the two of you is whether or not this is going to exist?

A "Is going to exist," that's right. And I gave some reasons why I think that, you know, the appropriate way to look at it is the way that's long-term historical evidence or current evidence, but not choosing some period that just happens to suggest an answer one way or the other.

Q I'm going to try again. I apologize, but I still don't feel like I got a "yes" or "no."

The question, Dr. Christensen, is whether or not you agree that the only difference between you and Dr. Selwyn on the input price differential question is the question of whether as a factual matter there is going to be such an input price differential?

MR. SASSER: Your Honor, I'm going to object. That's been asked and answered twice.

Dr. Christensen made very clear what his answer was and the reasons for it.

MR. FABER: No. He told us whether he thinks there's going to be an input price differential or not. I didn't ask him whether he thinks there's one. I'm asking if the difference between him and Dr. Selwyn is on the factual question of whether there's going to be one.

ALJ REED: Dr. Christensen, if you understand Mr. Faber's question, could you give him a direct response, please?

THE WITNESS: Yes.

The answer is no, that's not the only difference between Dr. Selwyn and myself on the input price issue. That is a difference.

MR. FABER: Q Can you tell me what the other differences are?

A Well, there's really a huge amount of testimony going on about input pricing, and I don't agree with all of that.

And I have made clear in my testimony what I believe about input prices. You spent the whole morning questioning me about things that go into the input prices suggesting that, since he's been whispering in your ear all morning, presumably that there's a disagreement about the way I measure input prices and he'll have a lot to tell about how you should measure input prices.

So obviously, we don't completely agree on all that about input price. But we certainly do disagree as to -- sir, we do agree that the conceptual issue is, on a going-forward basis, whether there will be a difference in input prices.

Q And just to be clear, you do agree that if there is a difference in input -- a differential in

input prices that it ought to be taken into account in the productivity factor?
A Not in a productivity factor; in the X factor.
Q I refer to the them interchangeably. But that's not --
A Well, it's not a productivity issue.
Q Okay. X factor.
A Yes.
Q Now, real briefly, we talked earlier about TPIs, telephone plant indexes or indices.
A Yes.
Q There's a separate TPI maintained for each type of plant; correct?
A Well, for a price, probably six categories of plant, those categories presumably can be broken down into additional categories, but there are a set of TPIs.
Q Well, isn't one of them office equipment that we've been talking about; correct?
A Correct.
Q Transmission equipment?
A That's correct also.
Q Now, what is the unit that is used to measure the price changes for each of the TPI categories?
A There are no units. They are pure numbers.
Q Well, are we talking about a unit of capacity in measuring the changes in price, or are we talking about some physical attribute of the category?

A No. It's a -- the TPI is a -- what the price per unit is in any year relative to what it was in 1984.

Q Well, let's talk about central office equipment. What type of unit are we talking in measuring the price change in central office equipment?

A Well, in terms of the investment figures, the -- it's the dollar investment in central office equipment.

And then that that in fact is what must be done to get a TPI is to break that into a price and quantity component.

And that is what the specialists at the LECs were charged with doing was to take the investment in central office equipment, all the other categories, and say what part of this constitutes quantity and what part constitutes price. And that's in fact what they do.

Q And my question to you is, what is it we are measuring when we talk about the quantity?

A It's the quantity of capital.

Q If you are doing a TPI for automobiles, you could pick a particular car and you could price it each year and you could change -- you could determine a price index for it; isn't that right?

A Yes, if it were a the same car last year and this year. You could see what the price is for that car.

Q And a TPI is designed to measure the same item over a period of time and the change in the price of that item; right?

A That's correct.

Q When you do that for central office equipment, as a category, what exactly is it that you're measuring to see what prices changed?

A Well, as Dr. Schmalensee testified yesterday, you have to take quality change into account, and that's a challenging thing to do. But that's one of the things that we as economists are trained to do, and what the people at the Bureau of Labor Statistics do, and what people at the LECs have done in order to come up with these TPIs.

Q What methodology do you use -- stick for a moment to central office equipment, for example -- to measure quality changes over time?

A Well, as I testified this morning, I did not measure quality changes over time. I taught the TPIs. They were prepared by the LECs.

Q Well, that's fine. But then what methodologies did the LECs use to measure quality changes over time, if you know?

A I don't know in detail what they did.

Q So you don't know, for example, whether they properly took into account quality changes over the eight years that they measured?

A By the same token that I do know whether the Bureau of Labor Statistics properly took into account capital when they were doing total factor productivity for the U.S. economy.

It's not possible for me to go and know in detail what each and every person did. There's a certain point where I have to take the data that's given to me.

MR. FABER: Your Honor, that's all the questions I have for Dr. Schmalensee -- I'm sorry, Dr. Christensen. But I do want to resolve the issue that I raised earlier about the workpapers.

I've had a chance to go back and look at the data requests, and we asked for the underlying workpapers for three categories of items.

ALJ REED: Right.

MR. FABER: The changes to the 1984 capital stock; the changes to the TPIs; and the changes to the booked capital accounts. These are Data Request Nos. 6, 7 and 8. And I would like to have those provided to me, and I would like to have an agreement that, without having to recall Dr. Christensen, they can be admitted as exhibits in this case for purposes of briefing since I won't have any questions for him other than to verify that these are the actual documents.

I'm willing to accept counsel's representation that they are the actual underlying workpapers.

ALJ REED: Mr. Sasser?

MR. SASSER: Yes.

ALJ REED: Okay.

MR. FABER: And then can we reserve exhibit numbers, or we can just agree that we'll put numbers on these with they arrive?

ALJ REED: That's fine.

MR. FABER: Thank you, your Honor.

With that, I'm finished. Thank you, Dr. Christensen.

ALJ REED: Ms. O'Reilly.

MS. O'REILLY: Very briefly.

CROSS-EXAMINATION

BY MS. O'REILLY:

Q Good morning, Dr. Christensen. My name is Kathleen O'Reilly and I represent TURN in this proceeding.

A Good morning.

Q Good morning.

I'd like to direct your attention to the bottom of page 15 of Exhibit 6, beginning at the second-to-last line.

Do you see that part of your testimony where you state that the LEC output growth rate for 1990 to 1993 was 2.9 percent, and the time frame 1984 to 1989, that rate was 3.8 percent?

A Yes, I do.

Q My question is, how do these LEC output growth rates compare to output growth rates for the economy as a whole during those same periods?

A I don't know.

Q Do you have information available that would make possible your determination of that comparison?

A Sure. Not available here, but in my office I do.

Q If you could provide that as a late exhibit, I would appreciate it.

A Okay. I'd be happy to do this.

MS. O'REILLY: If we could, your Honor, reserve a space for that.

ALJ REED: Yes.

MR. SASSER: Could I have the request restated so I'm clear?

MS. O'REILLY: Surely. For the time frames 1990 to 1993, and the 1984 to 1989, if he could provide what the output growth rates for the economy as a whole were for those two time periods.

Is that that clear?

MR. SASSER: Thank you.

MS. O'REILLY: Q I'd also direct your attention to Chart 1 on that same page.

A Yes.

Q And ask if that chart, in your opinion, basically reflects a standard business cycle; namely, that output growth rates will increase during a period of economic expansion decline during a period of recession and demonstrated upswing when the economy is pulling out of a recession? ]

A Well, this dotted line looks like a business cycle, but it doesn't coincide with the national business cycle.

Q For that period?

A That's correct.

Q But as a general principle, it reflects what would be a common cycle of up-swing/down-swing to reflect expansion in an economy, recession, and the transition between the two?

A Yes. It would have a similar shape as the business cycle for the U.S. economy.

Q All right. Dr. Christensen, do you have an opinion as to whether it is the absolute level of an LEC TFP growth that is relevant to the determination of the X factor, or is it the level of the LEC TFP growth rate relative to the entire U.S. TFP growth rate that is relevant to the X factor issue?

A It's the latter.

Q So the up-swing or the down-swing of the LEC output growth rate is only relevant to the extent that it varies from the U.S. economy as a whole's output growth rate?

A Well, that's an interesting way to look at it.

I haven't looked at it that way, and I think that tends to complicate the issue, because then we'd be saying, well, the X factor is going to be based on a differential output growth rate and a differential input growth rate, when it's really the combination of those.

You combine the output growth rate and the input growth rate to get a TFP growth rate.

I think it's complicated enough to try to figure out what the right TFP growth rate is let alone trying to say let's try breaking it up into pieces and start looking at the pieces.

So you can break it up that way, but I don't think it's helpful.

Q Stated another way, at any period of time they're coincident, would you agree that looking at the LEC TFP growth rate isn't relevant because it is coincident with the U.S. Economy as a whole growth rate for that period?

A It is certainly not uninteresting to compare output growth rates.

As I've said, I don't think it's particularly helpful, but there's no harm in looking behind the TPF growth out and if there's some cycles in input and output that lead one to think differently about the differential, I think that's fine.

Q In preparation for your testimony, did you have occasion to review recent Pacific Monthly Monitoring Reports?

A Not that I recall.

MS. O'REILLY: That's all I have, your Honor.

MS. BURDICK: Your Honor, could I just ask a couple of clarifying questions related to that.

ALJ REED: Yes.

MS. BURDICK: The first one is, I'm uncertain whether Ms. O'Reilly intended to reserve an exhibit number for the national economy output growth rates that she requested, or if, as Mr. Faber did, one will just be assigned when those documents are provided.

ALJ REED: I'm assuming that, Ms. O'Reilly, you meant the same thing that Mr. Faber did, that when they come in, I will assign an exhibit number to them.

MS. O'REILLY: Whichever is most efficient for your purposes is fine with me, your Honor.

ALJ REED: Okay.

MS. BURDICK: And is that how you'd like to approach it, your Honor?

ALJ REED: Yes, that's how I'd like to do it.

MS. BURDICK: Then I just had one other question, if I could, to follow on the computation of that; the provision of that.

ALJ REED: Yes.

CROSS-EXAMINATION

BY MS. BURDICK:

Q Dr. Christensen, in providing that information regarding the national economy output growth rates, would you have to perform a computation much like that reflected on Table 1 on page 10 of Exhibit 6?

A Yes.

Q Would you mind, Doctor, also providing those underlying numbers in addition to the averages that Ms. O'Reilly requested?

A So are you asking would I provide the year-by-year output growth for the U.S. economy?
Q Yes, sir.
A Yes, I would provide that.
MS. BURDICK: That would be very helpful. Thank you.
That's all I had, your Honor. Thank you for your patience.
ALJ REED: Ms. Grau

CROSS-EXAMINATION

BY MS. GRAU:
Q Dr. Christensen, my name is Janice Grau, and I represent the Division of Ratepayer Advocates.
Good morning still.
A Good morning.
Q You were discussing with Mr. Faber the differences that you remember between the assumptions you used and the Bureau of Labor Statistics uses in its TFP studies.
Now, on page 9 of your reply testimony, that is, page 9 of the exhibit attached to -- the attachment to Exhibit 7, you state, in the first full paragraph, the fifth line down,

"For my USTA study of LEC productivity growth, I used Moody's composite yield for public utility bonds as a proxy for the opportunity and cost of capital for all LECs."

Does the BLS use a similar approach to measure the opportunity cost of capital?
A No. As I stated here, that this is a difference in reason that the input prices for the U.S. economy and the LECs are not directly comparable because they use a different procedure there, which is more -- probably it is -- it's a broader opportunity cost of capital that includes equity costs as well as interest cost.
Q Okay. So then your footnote here actually is stating that since you do not use equity, you in effect are stating that the BLS does use equity?
A That's correct, and so that's right.
So this would be another difference I had not referred to this morning. That's correct.
Q And therefore the use of equity by BLS in measuring the opportunity cost of capital would lead to a different pattern of input price growth?
A For the LECs you're saying --
Q For the LECs.
A -- if I include equity costs?
It would, yes.
Q Now, on page 10 you state that, again towards the end, it starts four lines up, that,
"The existence of a short-term
1984 to 1990 input price
differential is not in dispute."
Would you similarly agree that --

A Can I see where that statement is? I haven't found it yet.
Q Yes. It's page 10, and it's towards the bottom.
A Page 10.
Q And it's towards the bottom, four lines up.
A I have it. Thank you.
Q Would you similarly agree that over the 1984 to 1993 period, that there is an empirical basis for concluding that an input price differential exists between the telecommunications industry and the U.S. economy?
A Yes.
Q Now may I go to your prepared testimony, Exhibit 6, and Appendix 1 at page 12.
Under the Labor section, the first sentence of the second paragraph states,

> "The cost of labor input is equal to expensed wages and salaries plus expensed benefits,"

and that's how you measure the cost of labor, as the sum of expensed wages and expensed benefits, is that correct?
A That is correct.
Q And in your workpapers which support Appendix 1, you show a 9.92 percent increase in the price of labor between 1992 and 1993, is that correct?
A I would accept that subject to check.

Q Now, is it a possibility that that increase in the price of labor could be the result of including such items as golden handshakes as part of expensed benefits due to restructuring efforts and force reductions?

A It is possible.

In fact, it's my understanding that although a large portion of such expenses are not included in the labor report, there is not uniformity by the LECs in their Form M and indeed there are some, some expenses such as that included.

MS. GRAU: Thank you, Dr. Christensen.

That's all I have.

ALJ REED: Mr. Golabek, did you have any clarifying questions.

MR. GOLABEK: No, I haven't.

ALJ REED: Okay.

EXAMINATION

BY ALJ REED:

Q Dr. Christensen, I just wanted to ask you two questions.

I wanted to know whether or not you think rate of return regulation can hinder efficiency?

A I do.

Q I also would like to know whether or not you think that Pacific Bell has suffered severe financial repercussions due to the price cap formulas' use of 4.5 and 5 percent over the last five years and nine months?

A I have not studied their financial situation so I don't consider myself an expert on the topic, but it is my casual opinion that I don't believe that they -- to date have suffered severe financial harm as a result of the price cap formula.

ALJ REED: Thank you.

Mr. Sasser, did you have any redirect?

MR. SASSER: Yes, just a few short questions, your Honor.

REDIRECT EXAMINATION

BY MR. SASSER:

Q Mr. Faber questioned you about your response to Data Request 5 which is contained in Exhibit 8 for identification.

Do you happen to have a copy of that before you?

A Data request, which number?

Q Five.

A Five.

MR. FABER: Excuse me, your Honor.

ALJ REED: Yes.

MR. FABER: I don't remember asking any questions about Data Request No. 5.

MR. SASSER: You certainly did.

They were in the nature of Dr. Christensen's statement that he didn't know how the errors were discovered.

MR. FABER: I asked him that about 6 and I asked him that about 7. I didn't ask him about 5.